STIC Search Report
EIC 3700

STIC Database Tracking Number: 104740

TO: Minh Trinh
Location: cp2 5d29
Art Unit: 3729
Monday, September 29, 2003

Case Serial Number: 10/041638

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Search Notes

Attached is a machine-translated copy of JP 5-241660, and an English abstract.

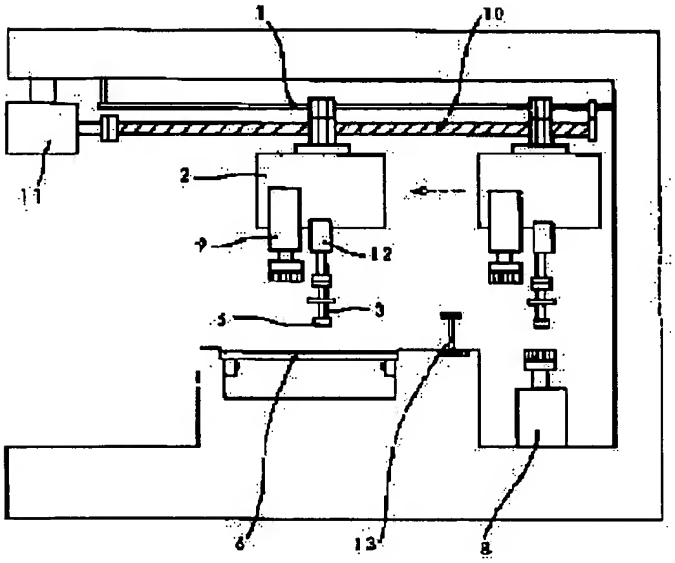
Searching by Document Number

** Result [Patent] ** Format(P803) 30.Sep.2003 1/ 1

Application no/date: 1991- 88134[1991/04/19]
Date of request for examination: [ ]
Public disclosure no/date: 1993-241660[1993/09/21] Translate
Examined publication no/date (old law): [ ]
Registration no/date: [ ]
Examined publication date (present law): [ ]
PCT application no
PCT publication no/date [ ]
Applicant: HITACHI LTD
Inventor: TOMITA MASAMICHI,HONMA MAKOTO,FUJISHIRO KEISUKE,AJIKI NAOJI,SAKAI AKIHIKO
IPC: G05D 3/12 G05D 3/12
FI: G05D 3/12 K G05D 3/12 T
F-term: 5H303AA05,AA10,BB03,BB12,CC01,CC06,DD09,DD25,FF12,FF14,GG14,HH01
Expanded classification: 223,361
Fixed keyword:
Citation:
Title of invention: THERMAL DEFORMATION CORRECTING METHOD FOR ELECTRONIC PART LO
Abstract:

PURPOSE: To keep the loading accuracy of electronic parts onto a substrate satisfactory for a long time by repeatedly executing position correction in a fixed cycle so as to correct position deviation while measuring the position of an adsorbing device to an image pickup device for recognizing parts.

CONSTITUTION: An adsorbing nozzle 3 is loaded to an adsorbing device 12, and nothing is adsorbed to the nozzle 3. The adsorbing device 12 is positioned in the field of view above an image pickup device by operating a robot 1. The adsorbing device 12 is autonously positioned at every angle equally dividing a circumference, the image of the adsorbing nozzle 3 is picked up by an image pickup device 8 plural times such as fourtimes at every 90°, for example, and the central position coordinate of the silhouette of each image is measured. The average value of all the measured values is calculated, and this value is defined as the rotational center position coordinate of the adsorbing nozzle 3. At this time, when the thermal deformation of a ball screw 10 is in a transient state and it is estimated that the necessity of correction is high, the correction is repeatedly executed in the fixed cycle only during that period. On a stage where the ball screw reaches normal temperature and the extension is converged at a fixed value, the machine is continuously operated without being corrected.

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Priority country/date/number: (  ) [          ] (            )
Classification of examiners decision/date: () [          ]
Final examinational transaction/date:      (withdrawal by no request for examinat
Examination intermediate record:
 (A63    1991/ 4/19,PATENT APPLICATION UTILITY MODEL REGISTRATION APPLICATION,140
 (A523   1991/ 9/26,WRITTEN AMENDMENT,     : A)
 (A523   1992/ 9/25,WRITTEN AMENDMENT,     :  )
 (A08    1993/ 4/ 6,WRITTEN DISPOSITION,     : A)
 (A961   1993/ 4/ 8,CORRECTION DATA BY EX OFFICIO (FORMALITY),     :  )
 (A961   1993/ 4/ 8,CORRECTION DATA BY EX OFFICIO (FORMALITY),     :  )
 (A7421  1993/11/ 2,NOTIFICATION OF CHANGE IN REPRESENTATIVE,     :  )
 (A961   1993/12/24,CORRECTION DATA BY EX OFFICIO (FORMALITY),     :  )
 (A300   1998/ 7/11,MAKING OF FILE WRAPPER EXTRACTION LIST OF UNREQUEST FOR EXAMI

*** Trial no/date           [          ]  Kind of trial [] ***
 Demandant:    -
 Defendand:    -
 Opponent:     -
 Classification of trial decision of opposition/date: () [          ]
 Final disposition of trial or appeal/date:           () [          ]
 Trial and opposition intermediate record:

Registration intermediate record:

 Amount of annuities payment:     year
 Lapse date of right:  [          ]
 Proprietor:    -
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Other Drawings...

Patent/ public disclosure document
1993241660

[Abstract(made by the applicant)] [Claims] [Detail Description] [Drawing Description]

(57)
[ABSTRACT]

[PURPOSE]
Accessories adsorption lay acknowledgement error due to thermal expansion of a ball screw of electronic component wearing machine is compensated, and keep wearing accuracy of an electronic component to the basal plate top well.
[CONSTITUTION]
Robot for wearing head transportation positions adsorption equipment in field of vision of imaging device for accessories acknowledgement fixed to body in predetermined event during an automatic operative method, and stop position of adsorption equipment is measured by imaging device, and determination result is based on, and control device updates origin location data in field of vision for accessories acknowledgement.
[EFFECT]
Because origin location data of accessories acknowledgement visual field can be updated at any time, even if a ball screw is up to, and thermal expansion is done within maneuvering, and robot lay in accessories acknowledgement moves, lay as opposed to adsorption branch of accessories can be measured, wearing accuracy to the basal plate top can be kept.

[WHAT IS CLAIMED IS:]

[Claim 1]
In electronic component wearing airplane of the configuration which wearing head comprising adsorption equipment moves by means of action of robot, and load an electronic component on a circuit board; Amendment method of heat deformation of electronic component wearing machine; wherein; Said robot positions adsorption equipment in field of vision of imaging device for accessories acknowledgement fixed to body in predetermined event during an automatic operative method, and stop position of above adsorption equipment is measured by above imaging device, and determination result is based on, and control device updates origin location data in field of vision for accessories acknowledgement.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[INDUSTRIAL APPLICATION FIELD]
The present invention relates to a concerning amendment method of heat deformation of robot and more particularly relates to calibration method of deformation due to thermal expansion of a component part of robot transporting wearing head of, electronic component wearing airplane.
[0002]

[PRIOR ART]
An electronic component was loaded by means of conventionally perpendicular mold or the method which seemed to be equal to or less than by electronic component wearing airplane of the configuration which wearing head comprising adsorption equipment moved by means of action of robot of joint mold, and loaded an electronic component on a circuit board.
[0003]
Adsorption equipment photographs an electronic component by imaging device for electronic

component acknowledgement fixed to electronic component wearing airplane body in the middle of the path which vacuum adsorbs an electronic component from the accessories feeder top, and move to wearing target location, and displacement of an electronic component as opposed to adsorption equipment (the first displacement) is measured, after having moved wearing head, wearing target pattern printed on a circuit board by imaging device for pattern carried by wearing head is photographed, and displacement of wearing target pattern as opposed to imaging device for pattern (the second displacement) is measured, control device operates displacement of adsorption equipment as opposed to wearing target pattern (the third displacement) from the second displacement, the first displacement and the third displacement are made from, and amendment is added to wearing head lay at the time of wearing.

[0004]

When, in method, an electronic component adsorbed by adsorption equipment is photographed conventionally, pictorial image of adsorption equipment head (that is to say, branch) cannot be arrested by imaging device for electronic component acknowledgement. Therefore, The lay determination which is right of adsorption equipment receiving effect of lay repeat error of robot directly is impossible.

[0005]

Even if adsorption equipment head was displaced from origin lay in coordinate in faceplate for electronic component acknowledgement, if this displacement is constant two dimension vector quantity, wearing action can be carried out without inconvenience of parenchyma by proofreading origin lay of faceplate. In general terms, pictorial image of adsorption equipment head of the condition which accessories nothing adsorbs in appointed lay in detection is photographed before automatic operative method in method beforehand conventionally, self advancing axis of head when it made center of pictorial image of head or adsorption equipment rotate is had, and it is with origin lay of an output image of imaging device for electronic component acknowledgement, and it is done.

[0006]

[PROBLEM TO BE SOLVED BY THE INVENTION]

However, The ball screw which is often used as power transmission / reducing gear of robot, for example, does thermal expansion along with time due to evolution of heat of drive assembly or sliding friction, when adsorption equipment lay at the time of electronic component imaging watched from a coordinate system installed by a component part other than the electronic component wearing airplane that heat of comparison does not reach changes, the lay that it should be moves to origin of pictorial image for electronic component acknowledgement, business is not done only in initial calibration.

[0007]

Origin lay of pictorial image will be proofreaded as a function of elapsed time after start-up once, it is conceivable that value proofreaded in automatic operative method of afterward is referred to, but, because it is different in operating condition every class of a circuit board and, together with activity, is that is to say different in quantity of heat occurring with maneuvering, it is not practical too much.

[0008]

On the other hand, In general terms, about method compensating the deformation which accepted alteration of environmental temperature of apparatus, the method which room temperature value is measured regularly, and it returns, and update calibration lay is that is to say possible environment temperature, but, because factor of linear expansion of a ball screw due to evolution of heat of sliding friction or drive assembly becomes dominant to a master by electronic component wearing airplane, correlation with alteration and linear expansion of environment temperature cannot use environment temperature low. In addition, Because deformation of a component part produces even an articulated robot without the use of a ball screw due to fever of sliding friction and drive assembly of power transmission part, issue of similar is had.

[0009]

Corrective action such as control of attrition calorific power of a ball screw, cooling method is described applied mechanical engineering, Vol. 28, 4 (1987), p98 ... p103, "fever and a countermeasure of a ball

screw". However, When heat transformation occurred once, it is conceivable with the compensating means how method to proofread in appropriate method in the appropriate time is the most certain. What imaging device in electronic component imaging lay for electronic components is used with electronic component wearing machine, and proofread for vision, of practical use, and it is effective.
[0010]
In addition, Other than linear expansion of a ball screw, enforcement of calibration is indispensable for effect of environmental temperature and factor other than wearing head isoelectric child accessories wearing machine or an electronic circuit of an image processing system to cope with origin drift of faceplate due to electrical characteristic alteration by evolution of heat after electrification beginning collectively.
[0011]
It is an object of the present invention to provide the method which electronic component adsorption lay acknowledgement error caused by thermal expansion of a ball screw is compensated, and long time is lasted for, and keep wearing accuracy of an electronic component to the circuit board top well.
[0012]

[MEANS TO SOLVE THE PROBLEM]
The lay calibration measure which, according to the present invention, lay of adsorption equipment as opposed to imaging device for accessories acknowledgement is measured in control device of electronic component wearing machine, and compensate position error is comprised to achieve the object, lay calibration measure is repeated in timing set within in automatic operative method action beginning and action beforehand, and it is carried out.
[0013]

[OPERATION]
Control device updates origin location data in field of vision for accessories acknowledgement when electronic component wearing machine starts automatic operative method actuating and and robot positions the adsorption equipment which charged the adsorption equipment which nothing adsorbs in field of vision of imaging device for accessories acknowledgement fixed to body in timing set beforehand or lay calibration jig in accordance with lay calibration measure, and stop position of adsorption equipment is measured by imaging device within execution. Wearing lay is compensated by updated origin location data.
[0014]
Till wearing of an electronic component of the uniformity number is completed in uniformity cycle after automatic operative method beginning just before timing set beforehand to update origin location data starting, for example, an automatic operative method, it is carried out in uniformity cycle.
[0015]

[EXAMPLE]
Embodiment of the present invention is explained in detail by means of drawing in the following.
[0016]
FIG. 2 is a perspective diagram to show framing of electronic component wearing airplane to apply each embodiment of the present invention in. Wearing action of electronic component wearing machine is explained by means of FIG. 2. Wearing head 2 moves horizontal surface (a XY plane) by means of XY robot (perpendicular two axis type robot) 1. Piece in a *thing* of adsorption branch 3 of the plural number that can be changed in tip of adsorption equipment 12 installed in wearing head 2 is charged. Wearing head 2 is moved in top of electronic component feeder 4, it makes adsorption equipment 12 descend, and vacuum adsorbs electronic component 5. Robot 1 is moved, and adsorption equipment 12 is positioned in top of imaging device 8 fixed to body of electronic component wearing machine, and pictorial image of electronic component 5 is photographed. Next, Imaging device 9 provided near wearing head 2 seems to come to top of lay loading direction at first of circuit board 6, robot 1 is moved

again, and pictorial image of wearing target pattern 7 is photographed, image processing system 14 and control device 15 operates lay amendment dosage from data of pictorial image of two leaves, adsorption equipment 12 seems to come right above compensated direction wearing lay, and robot 1 is moved. It makes adsorption equipment 12 descend again, and electronic component 5 is put on on wearing goal pattern 7.

[0017]

FIG. 3 explains the mode which origin lay of pictorial image moves to by means of heat deformation of a ball screw. Ball screw 10 is up to, and, with perpendicular type robot 1 that used ball screw 10 as power transmission / reducing gear, it is in elevated temperature by evolution of heat and sliding friction heat of drive assembly 11 after start-up, and it expands. Depending on temperature rise and coefficient of linear expansion of ball screw 10, burden travel of robot 1 as opposed to constant angle of rotation of drive assembly 11 increases.

[0018]

When, with electronic component wearing machine, it is loaded on case photographing electronic component 5 adsorbed to adsorption branch 3 charged by tip of adsorption equipment 12 and circuit board 6, location accuracy of XY robot 1 is called for particularly. Usually, Because pictorial image of circuit board 6 is photographed with imaging device 9 provided near wearing head 2, and wearing head 2 and relative position between *things* of wearing target pattern 7 (ed including effect of heat deformation) are operated at every wearing action in wearing lay, it is not had it is repeated to be able to hold for amendment of heat deformation, and to proofread. However, It is repeated, and, in electronic component exposure lay, it must be positioned on a coordinate system of imaging device 8 fixed to body of electronic component wearing machine by uniformity lay. Imaging device 8 does not receive most of the effect of heat deformation, it is up to, and stop position of wearing head 2 proofreads center location of adsorption branch 3 in what move by thermal expansion appropriately, and origin lay is updated.

[0019]

Maneuvering schedule of the first embodiment of the present invention is shown in FIG. 1. In FIG. 1, axis of abscissa expresses time. Event to proofread is expressed in arrow. Till, after automatic operative method beginning, constant time T_{zero} passes, calibration is carried out every constant cycle T ($<T_{zero}$). By way of example only, As a T_{zero} =60, a T =15, calibration is carried in total out to a time of day t =0,15,30,45,60 five times.

[0020]

An autocalibration operation is done in the following method. Adsorption equipment 12 is loaded with adsorption branch 3, nothing is adsorbed to adsorption branch 3. Or, as another alternative, it is exchanged with adsorption branch 3 to adsorption equipment 12, and one lay calibration jig 13 is charged. Base of lay calibration jig 13 is put in elevation same as head elevation of adsorption branch 3. Robot 1 is operated, and adsorption equipment 12 is positioned in visual field of eight imaging device top. The by angle which equal percent makes circumference makes they rotate, and position adsorption equipment 12, and, by way of example only, imaging device 8 photographs pictorial image of adsorption branch 3 (jig 13 or located, and to proofread), and plural (a circumferential number of partitions) time measures center location coordinate of a silhouette of each pictorial image by 90 degrees four times. Average value of all measured value is calculated, and this is assumed center of rotation lay coordinate of adsorption branch 3.

[0021]

Only period expected that necessity of calibration is big in transient state is repeated, and, according to the present embodiment, heat deformation of ball screw 10 carries out calibration, because it is cut in continuation automatic operative method without what is stopped by calibration in phase expected that ball screw 10 reaches stationary temperature, and the dilatation converges in uniformity value, calibration of right and efficiency is effective in being enabled. In addition, When origin drift due to electrical characteristic alteration by fever after electrification beginning occurs in coincidence in an electronic circuit of image processing system 14, calibration of right and efficiency is enabled.

[0022]
In addition, According to method single lay calibration jig is charged, and to proofread, the calibration which is high high accuracy of repeatability more without it being influenced dimension error of each adsorption branch is enabled.
[0023]
In addition, Till, after automatic operative method beginning, constant time T_{zero} passes, instead of carrying out calibration every constant cycle T, till wearing of an electronic component of the appointed number is completed, effect of equivalence is approximately provided by method carrying out calibration every uniformity cycle T. Even more particularly, After, more practical method, time T passed from the last calibration event, it is conceivable that calibration new just before that starting wearing to the next basal plate is carried out.
[0024]
Maneuvering schedule of the second embodiment of the present invention is shown in FIG. 4. Whenever wearing to a circuit board of the constant number of sheets is started after case and the start-up that electronic component wearing machine starts an automatic operative method or whenever wearing to a circuit board of the uniformity number of sheets is finished, calibration is carried out. Just before beginning of automatic operative method action, wearing to each circuit board of the next N blade is started after termination by wearing to each circuit board of an N blade, calibration activity is carried out for an auto just before that, calibration activity is repeated every circuit board wearing of an N blade afterward.
[0025]
Transformation due to thermal expansion of a ball screw after start-up is coped with, and, according to the present embodiment, the calibration which is right is enabled, wearing accuracy of an electronic component improves in its turn.
[0026]
In addition, After having passed through the dormant period that constant time was older than afterward by will carry out calibration in start-up once, if there is, because temperature condition in start-up can approximately consider every time to be equivalence, the method which calibration every automatic operative method beginning is omitted in this case, and only the automatic operative method middle proofreads is possible.
[0027]
Maneuvering schedule of the third embodiment of the present invention is shown in FIG. 5. Whenever wearing of an electronic component of the constant number is completed after automatic operative method beginning, calibration is carried out. The second embodiment and approximately similarly correct calibration are effective in being enabled by the present embodiment.
[0028]
In addition, An object circuit board is large, and amendment of lay is effective in it being possible carefully when time to need for wearing to one piece of circuit board is had a long.
[0029]
Maneuvering schedule of the fourth embodiment of the present invention is shown in FIG. 6. Whenever, after automatic operative method beginning, only constant time T decided beforehand passes, the calibration is carried out. The third embodiment and approximately similarly correct calibration are enabled by the present embodiment.
[0030]

[EFFECT OF THE INVENTION]
According to the present invention, Because origin location data in visual field for accessories acknowledgement can be updated at any time, even if stop position of robot in electronic component acknowledgement moves within automatic operative method action continuation by means of heat deformation of a component part of electronic component wearing airplane, relative position as opposed to adsorption equipment of an electronic component can be just measured. Therefore, Wearing accuracy

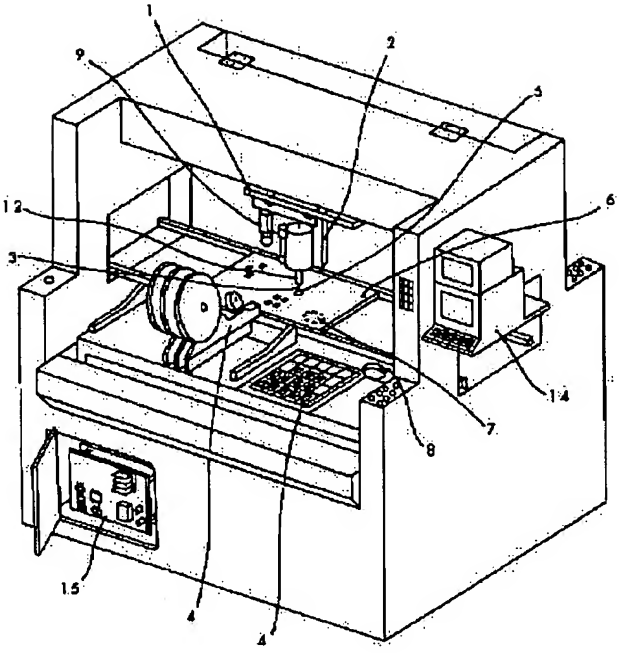
of an electronic component to the circuit board top can be kept well from the start *choku* next to long time.

[BRIEF DESCRIPTION OF DRAWINGS]

[FIG. 1]
It is an illustration to show maneuvering schedule of one embodiment of the invention.
[FIG. 2]
It is a perspective diagram to show framing of electronic component wearing machine to apply each embodiment of the present invention in.
[FIG. 3]
It is an illustration to show the mode which pictorial image origin lay moves by heat deformation in.
[FIG. 4]
It is a figure of maneuvering schedule of the second embodiment of the present invention.
[FIG. 5]
It is a figure of maneuvering schedule of the third embodiment of the present invention.
[FIG. 6]
It is figure showing maneuvering schedule of the fourth embodiment of the present invention.
[DENOTATION OF REFERENCE NUMERALS]
One ... XY robot, two ... wearing head, three ... adsorption branch, four ... electronic component feeder, five ... electronic components, six ... circuit boards, seven ... wearing target pattern, eight ... imaging device, nine ... imaging device, ten ... ball screws, 11 ... drive assembly, 12 ... adsorption equipment, 13 ... lay calibration jig, 14 ... image processing systems, 15 ... control device.

(fig.2)

図 2



(fig.3)

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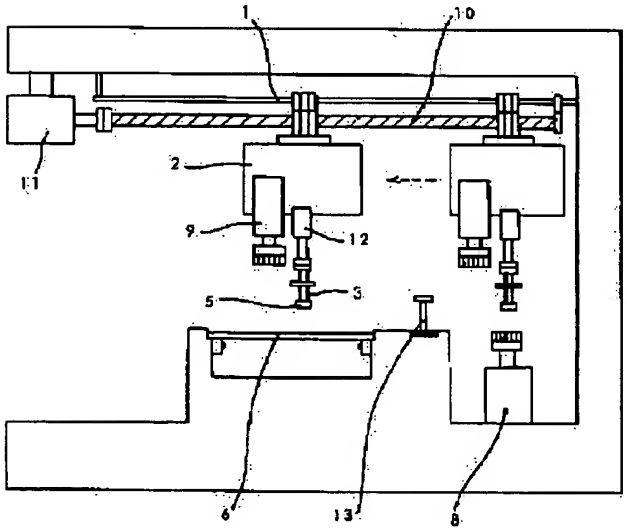

(fig.1)

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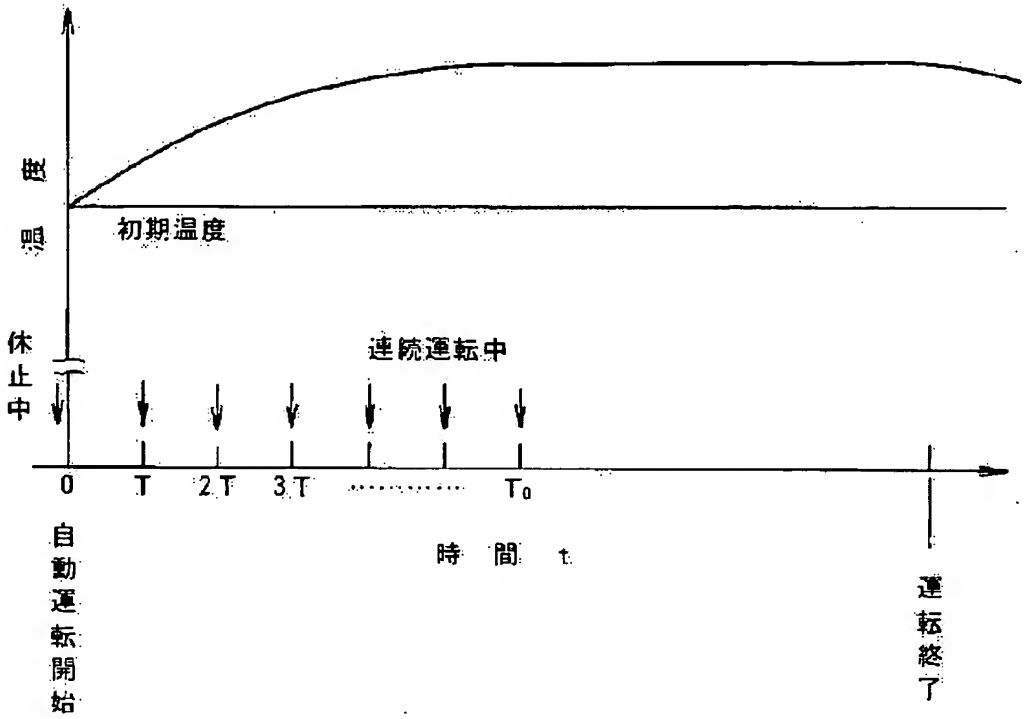

(fig.4)

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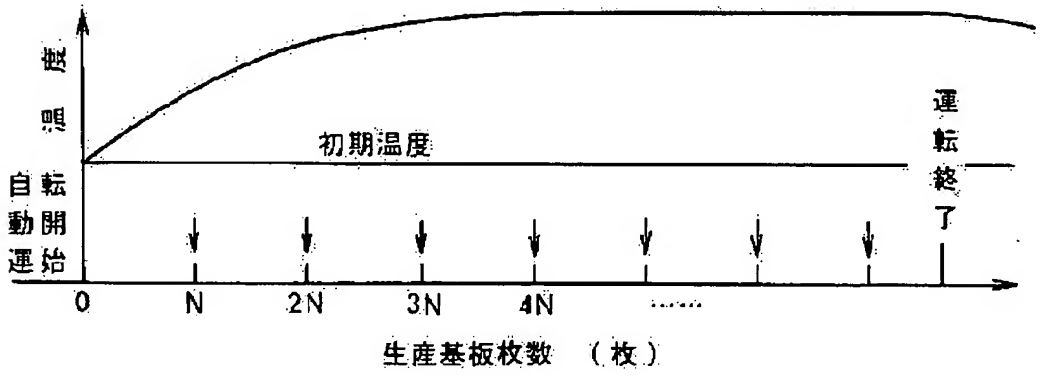
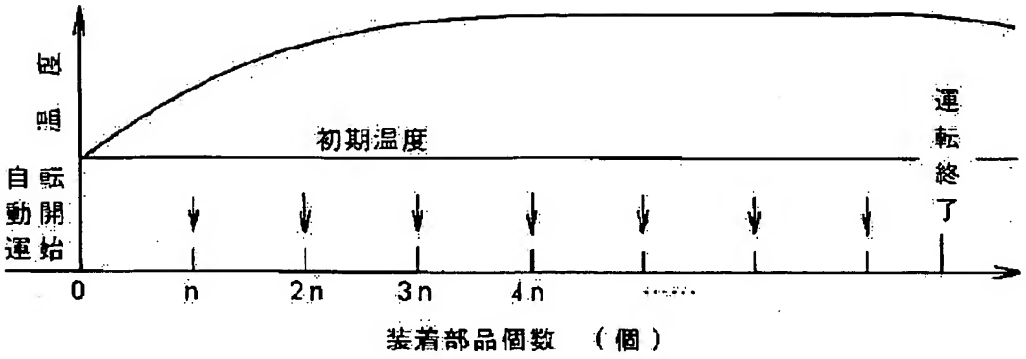


(fig.5)

図　5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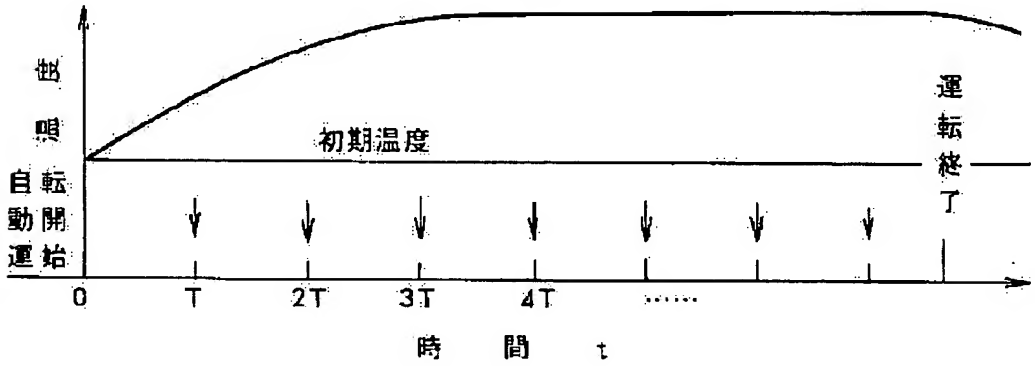
(fig.6)

図　6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